8630, 75 KSI (517 MPA), FORGING/BARSTOCK, H2S COMPATIBLE

Summary: This specification covers 8630 MOD3 steel forgings or bar stock with minimum yield strength of 75 Ksi (517MPa). This material is compatible with H2S service.

1.0 Scope

This specification covers 8630 MOD3 steel forgings or forged bar stock with minimum yield strength of 75 Ksi (517MPa). This material is compatible with H2S service. Note this material is typically not available for diameters less than 5 inch in diameter.

2.0 Referenced Specifications

Document	Description
API 6A/ISO 10423	Specification for Wellhead and Christmas Tree Equipment
NACE MR0175/ISO15156	Petroleum and natural gas industries - Materials for use in H_2S-containing environments in oil and gas production

3.0 Chemistry Requirements

The chemistry shall meet the requirements listed in Table 1.

Table 1: Chemical Requirements.
(All are maximums unless otherwise noted)

Elements	**Wt. Percentage (%)**
Carbon	0.25-0.33
Manganese	0.70-1.10
Chromium	0.85-1.00
Molybdenum	0.35-0.45
Nickel	0.75-0.90
Silicon	0.15-0.35
Phosphorus	0.025
Sulfur	0.025
Vanadium	0.06
Copper	0.25
Titanim	0.06
Aluminum	0.035

4.0 Mechanical Properties

The material shall meet the mechanical requirements of table 2.

Table 2: Mechanical Properties. (All values are minimums unless otherwise noted.)

Tensile Strength	95,000 psi (655 MPa)
Yield Strength	75,000 psi (517 MPa)
Elongation in 2", 4D	17%
Reduction of area	35%
Brinell Hardness (raw)	207-237 HBW
Brinell Hardness (finished part)	197-237 W

5.0 Heat Treatment :

PROCESS	ATMOSPHERE/MEDIA	TEMPERATURE	TIME AT TEMPERATURE
Normalized	Air	1598 ºF – 1697 ºF (870 ºC – 925 ºC)	30 Minutes / Inch of T, Minimum Time is 30 Minutes.

Still air cool to below 400 degrees F (204 degrees C) before further processing

Austenitize (Ref. Note 1& 2)	Air	1562 ºF - 1652 ºF (850 ºC – 900 ºC)	30 Minutes / Inch of T, Minimum Time is 30 Minutes.

Quench	Water	100 ºF (38 ºC) maximum before quenching 120 ºF (49 ºC) maximum after quenching
	Polymer	50 ºF (10 ºC) minimum before quenching (See note 3)
	Oil	----------

Quench baths shall permit complete immersion of material, provide for adequate circulation of the media or agitation of material, and provide a means for indicating the temperature of the media. Baths shall be adequate to produce the required properties in the most massive material to be quenched. There shall be at least one gallon of quenchant per pound of material quenched. Location of Quenching Equipment - Quenching equipment shall be located in such a manner and handling facilities shall function with sufficient speed to prevent the initiation of transformation or sensitization prior to quenching. Quenching shall take place in less than 60 seconds from the time the heat treatment load exits the furnace.

Temper	Air / Water	1184 ºF – 1328 ºF (640 ºC – 720 ºC).	1 hour per inch of maximum through thickness. One hour Minimum.

Cooling after tempering shall be air cooling or faster (By Water). Furnace cooling is not permitted. For heavy cross sections, rapid cooling after tempering may improve impact properties. The minimum tempering temperatures must be met in all cases to ensure that later steps of manufacturing,

Note: Maximum holding time shall not exceed Five times (5X) the minimum holding time. In all case, holding time shall not start until parts or materials have reached specified heat treatment temperature. The 5X rule does not apply to the separate QTC (e.g. ER 5")

Note 1: The short blasting shall be carried out after each process of heat treatment (normalizing, Austenitize & Tempering)

Note 2: The austenitizing temperature shall be less then the normalizing temperature.

Note 3: The minimum start temperature of 50 degrees F (10 ºC) for oil and polymer Quenchant shall be followed except when a lower minimum start temperature is permitted for a specific quenchant by the quenchant manufacturer. The start temperature shall be documented for all products.

5.1 Continuous Furnace Heat Treatment: Continuous furnace heat treatment shall be an acceptable alternative to conventional batch-type heat treatment for bars with diameters of 8 inches (203mm) or less. The following parameters shall be followed and reported in accordance with SES-26-590.

Minimum bar temperature exiting final zone of austenitizing furnace	1525 ºF (829 ºC)
Minimum time in austenitizing furnace	5 minutes (see note 2.1.g.1)
Minimum bar temperature exiting final zone of temperature furnace	1150 ºF (621 ºC)
Minimum time in tempering furnace	5 minutes (see note 2.1.g.1)
Minimum temperature of quench water	120 ºF (49 ºC)

Note 1: Continuous furnaces consist of several different temperature zones through witch the bar travels. The zone temperatures in the austenitizing furnace are chosen so as to heat the bar to a completely austenitic in a relatively short time. The bar is then spray quenched before entering the tempering. Zone temperatures in the tempering furnace are chosen to produce the desired tempering effect, again in a relatively short time. The time spent in the austenitizing and tempering furnaces depends primarily upon the length of the furnace and the travel speed. Travel speed varies according to the diameter of the bar. The time in each furnace shall be sufficient to attain the desired mechanical properties and to produce a microstructure to that obtained in a conventional quench-and-temper heat treatment.

6.0 DOCUMENTATION REQUIRED

6.1 Each shipment shall be accompanied by material certifications for each lot of material, the certifications must be positively relatable to the lot of material represented.
a) Mill certificate of raw material.
b) Chemical certificate for each lot of forging.
6.2 Mechanical properties certification as per section 4.0.
6.3 Impact testing certification as per section 5.0.
6.4 Certification of heat treatment including cycle time, temperature, cooling media, hardness and graphs.
6.5 Calibration certificate of furnace.
6.6 Ultrasonic test report certification of raw material.

7.0 TESTING TO BE CARRIED OUT BY SARA SAE

7.1 At the time of lifting forgings re-verification of chemical properties.
7.2 Recheck of tensile strength, yield strength, elongation, reduction in area, hardness, impact testing and UT testing.
7.3 100% MPI testing after machining.